

A coevolutionary framework for engaging trading partners in interorganisational e-commerce

Bruce McCabe

Thesis submitted for the degree of Doctor of Philosophy in the Faculty of
Information Technology, University of Technology Sydney.

2006

Statement of Authorship/Originality

I certify that the work in this thesis has not previously been submitted for a degree nor has it been submitted as part of the requirements for a degree except as fully acknowledged within the text.

I also certify that the thesis has been written by me. Any help that I have received in my research work and the preparation of the thesis itself has been acknowledged. In addition, I certify that all information sources and literature used are indicated in the thesis.

Bruce McCabe, December 2006



A handwritten signature in cursive script, appearing to read 'B. McCabe', is written over a horizontal line.

Acknowledgements

The following people must be acknowledged for their contribution to this thesis. The work is as much theirs as mine.

First and foremost, my thanks go to my wife Jane, for her patience, good humour and encouragement throughout the journey, and to my children, Sean and Elise, for their endless inspiration.

Thanks must go to my supervisors, Dr. Robert Kay, Professor Jim Underwood and Professor Louise Young, for not only putting up with me and doing all the things that good supervisors should do, but also being so generous with their friendship and guidance, and for introducing me to worlds I never knew existed.

Lastly, my thanks go to all the managers, in so many organisations and industries, who gave up hours of their valuable time to be interviewed. Without their generosity and goodwill this research could never have been completed.

Table of Contents

1.	Introduction	1
	Background.....	1
	Inspiration and purpose of the research.....	4
	An interpretive journey.....	5
	Terminology	6
	Structure of this thesis	8
	Contribution of the research	10
2.	Methodology.....	11
2.1	Philosophical perspective	11
2.2	Research method.....	12
2.3	Sample selection.....	14
2.4	Data collection.....	16
2.5	Analysis and interpretation.....	19
2.6	Phase II methodology	22
2.7	Research method (Phase II).....	22
2.8	Case selection (Phase II).....	24
2.9	Data collection (Phase II)	24
2.10	Analysis and interpretation (Phase II)	27
3.	Review of relevant research	29
3.1	Empirical research	29
3.2	Economic perspectives	38
3.3	Social theoretical perspectives.....	41

3.4	Technology-centric and other perspectives	48
3.5	Summary	50
4.	An analysis of ten systems.....	53
4.1	Results	53
4.2	Discussion.....	59
	Relating themes to economic perspectives	60
	Relating themes to social perspectives	62
	Reflecting on turning points	65
	Coevolutionary characteristics	68
5.	Coevolution, organisations and e-commerce.....	73
5.1	The application of evolutionary theory to organisations.....	74
5.2	Reflection on evolutionary concepts	78
5.3	Levels and units of analysis.....	79
5.4	Coevolution	82
5.5	Coevolution and alliances.....	86
5.6	Coevolution and technological innovation	89
5.7	The Rosenkopf & Nerkar framework for technological evolution.....	91
	Components	92
	Products	93
	Systems	93
	Coevolution	94
	Advantages of the Rosenkopf & Nerkar framework	95
5.8	Summary	96
6.	Coevolutionary interpretation of case Omicron	98

6.1	Overview	98
6.2	Site description	99
6.3	History of the eIOS	101
6.4	Coevolutionary interpretation.....	112
	Components and communities.....	112
	Forces.....	117
	Chance and intentionality	119
	Interpreting retention	121
	Associating components with subsystems.....	123
	Incorporating routines as components.....	125
	Abandoning subsystems for trading operations.....	128
	Reinterpreting the IOS	130
	Evolution of trading operations	132
	Evolution of the trading system.....	135
	Within-level effects	139
	Cross-level effects	144
	Between-system effects	148
	Rate of evolution	151
6.5	Summary of the framework	153
7.	Conclusions and implications.....	157
7.1	The journey.....	157
7.2	Implications for practice.....	158
	Working through iterative cycles of change.....	159
	Preparation for engagement.....	161

Making the first steps count.....	164
Nurturing positive feedback loops.....	164
Exploiting windows of opportunity	166
Action versus reaction	167
A new way of looking at the eIOS	167
7.3 Theoretical contributions.....	168
7.4 Methodological contribution	172
7.5 Further research	173
Testing the framework in the field	173
Mechanisms that promote feedback effects.....	174
The role of resource scarcity	174
Inter-system effects and extending the framework.....	175
Choosing different boundaries.....	177
7.6 Summing up.....	177
8. References	179
Appendix A: Ethical considerations	194
Appendix B: Format of semi-structured interviews in Phase I	195
Appendix C: Thematic analysis for ten e-commerce interorganisational systems.....	197
Appendix D: Practitioner checklist derived from thematic analysis	231
Appendix E: Format of semi-structured interviews in Phase II	236
Appendix F: Timeline of key events at case Omicron	238

List of Tables

Table 1: Interviews conducted during Phase I data collection	15
Table 2: Interviews conducted in Omicron case study.....	26
Table 3: Existing research perspectives and limitations.....	52
Table 4: System descriptions for ten eIOS cases.....	54
Table 5: Raw themes in engaging trading partners, ten eIOS cases.....	57
Table 6: Major turning points in ten eIOS cases	58
Table 7: Three perspectives as they relate to evolutionary theory.	77
Table 8: Comparison of hierarchies.....	155
Table 9: Strategies for engaging trading partners.....	159
Table 10: Key events & milestones in the evolution of the Omicron IOS	239

List of Figures

Figure 1: Stages of research and analysis.....	8
Figure 2: Tentative evolutionary hierarchy for case Epsilon	86
Figure 3: Product hierarchy for technological evolution.....	92
Figure 4: Selection entities and the product hierarchy for technological evolution.....	95
Figure 5: IOS comprised of technical components	113
Figure 6: Component-specific communities.....	115
Figure 7: First interpretation of IOS hierarchy	124
Figure 8: Trading operations comprised of social components (routines) and technical components.....	129
Figure 9: Second interpretation of IOS hierarchy	131
Figure 10: Selection entities and hierarchy for IOS evolution	136
Figure 11: OM-2 / OM-3 development interpreted as a positive feedback loop.....	140
Figure 12: OM-1 development interpreted as a negative feedback loop.....	143
Figure 13: Cross-level effects.....	146
Figure 14: Between-system effects.....	150
Figure 15: eIOS as expanding organisational boundaries	172

Abstract

The objective of this research was to produce a better understanding of the way trading partners engage in interorganisational e-commerce systems in order to help practitioners.

An interpretive philosophical approach was taken via an empirical study of ten e-commerce interorganisational systems, spanning a variety of technological approaches, trading scenarios and industry settings. Using semi-structured interviews, qualitative data were collected and a thematic analysis undertaken. The results suggested coevolutionary theory as a useful perspective for understanding the context. An in-depth case study was then used to build a detailed coevolutionary interpretation for the history of change, technological development and engagement in a single system.

The resulting framework incorporates social and technological components in a three level coevolutionary hierarchy. The e-commerce system is reconceptualised as a socio-technical trading system, and the move to Internet based trading operations as part of the ongoing evolution of that system. Under this interpretation interdependencies and coevolutionary effects, both between components and between levels, lie at the heart of understanding why trading partners are successfully or unsuccessfully engaged in e-commerce. Successful engagement is characterised by positive feedback loops, and failure is characterised by negative feedback loops and whole-part coevolutionary competition.